DETAILED SPECIFICATIONS
COLD WATER METERS - TURBINE TYPE
MAGNETICALLY DRIVEN
WITH ITRON ENCODER RECEIVER TRANSMITTER (ERT) AND
RADIO FREQUENCY METER READING SYSTEM

Section 1 - Scope

This specification covers turbine element cold water meters in sizes 1½" thru 20". The turbine meters must be of the in-line horizontal-axis type per AWWA Class II. Meters shall conform to latest revision of AWWA C701.

Section 2 – Operating and Physical characteristics

Operating characteristics of the meters shall exceed AWWA minimum standards as detailed in Table 1 in each of the following areas:

- Normal flow range
- Maximum continuous flow
- Maximum Capacity
- Pressure loss at maximum flow
- Extended Low flow accuracy

The turbine measuring chamber shall be a self-contained unit attached to the cover for easy field removal. The turbine spindles shall be stainless steel. The rotor shall balance or "float" between the turbine spindles throughout the typical operating range of the meter.

Casings shall not be repaired in any manner. The inlet and outlet shall have a common axis. Connection flanges shall be parallel. The 1-1/2" shall be oval flanged, the 2" size shall have optional oval flanges or round flanges and the 3", 4", 6", 8", 10" and 12" shall have round flanges per Table 3, AWWA C701. The 16" and 20" shall have raised face round flanges.

The 1-1/2" through 10" sizes shall have a maincase and cover of sand cast water works bronze containing not less than 75% copper or using the low-lead alloy Envirobrass II. The size, model, manufacturer's trademark, statement "AWWA Class II", and arrows indicating direction of flow shall be cast in raised characters on both sides of the maincase.

The 12", 16" and 20" shall have a maincase of cast iron. The size and arrows indicating direction of flow shall be cast in raised characters on both sides of the maincase.

All meter sizes (1-1/2" thru 20") shall have the size and arrows indicating direction of flow cast in raised characters on the housing cover. The cover shall contain a calibration mechanism for the purpose of calibrating the turbine measuring element while in-line and under pressure. The calibration mechanism shall be mounted under the register and have a protective cap.

One vertical NPT tapped boss shall be provided on the 1-1/2", 2, 3", 4", 6", and 8" housings near the outlet for use during field performance testing purposes or as a tap for pressure recording or as a secured port for gathering health department samples. The size per housing of these taps are as follows:

Meter Size	NPT Tapped Hole
1-1/2"	1"
2"	1-1/2"
3",4",6",8"	2"

Integral strainers shall be available for the 1-1/2", 2", 3" and 4" sizes.

Casing bolts shall be made of type 316 stainless steel.

Section 3 – Meter Warranties

All meters shall carry the following published warranties:

All 1-1/2 inch through 20 inch turbine meters shall be guaranteed to be free from defects in materials and workmanship for 12 months after shipment, and to meet or exceed AWWA C701-88 meter accuracy standards for a period of 12 months from the date of shipment.

Bronze meter housings shall be warranted to maintain their structural integrity for a period of 12 months from the date of shipment.

Section 4 – Registers

4.1 Straight Read and Electronic Encoder Registers (EER)

All meters shall permit the use of either a straight reading, permanently sealed local register or an electronic encoder register for connection to an automatic or automated meter reading system.

The register shall not be in contact with the water being measured.

The register devices shall be so designed to permit removal and exchange without removal of the meter from the service installation or interruption of service water supply.

Registers shall be of the center sweep test hand type that covers the entire dial face and a totalizing odometer.

The register shall be equipped with a separate low flow indicator for detecting small rates of flow, and shall display it in blue for Cubic Feet.

The meter size, model designation, and unit of registration (cubic feet), shall be clearly designated on the dial face.

The register must come equipped with a lid that covers the entire roll sealed, domed glass lens register, factory stamped with the meter serial number.

Registers shall be connected to the main case of the meter through the use of a security screw (torx) requiring a special tool for removal not readily availabe in the market place.

The register housing shall be thermoplastic or as an option, bronze register shrouds and lids shall be available for the straight-reading registers.

4.2 Electronic Encoder Register (EER) – Additional Requirements

The digital output of the encoder is equal to 1/10 of the quantity indicated by a single revolution of the test hand.

The register must be factory pre-wired to integrally mounted AMR devices requiring no wiring in the field.

The EER shall be encased in a housing which shall be a scratch resistant glass lens and a non-corrosive metal bottom. No plastic register lens or bottom are allowed.

The EER must be permanently sealed to provide moisture resistance to flooded pit or submerged conditions. The permanent seal between the glass lens and copper (metal) bottom shall utilize an adhesive seal without the use of gaskets.
Absolutely no gasketed seals or oil-filled encoder registers shall be accepted.

The EER must not be able to turn backwards.

The EER must have a low profile consistant with a straight read register of approximately 2”.
All wiring must be through the back of the register to reduce overall EER height.

4.3 Warranties

All straight reading register assemblies shall be guaranteed for a period of five (5) years from the date of shipment.

All digital and absolute encoder registers shall be guaranteed for a period of ten (10) years from date of shipment.

Section 5 – Itron ERTs

All Itron ERTs shall come pre-programmed and ready for immediate installation.
ERTs shall come with necessary mounting hardware to include a mounting bracket for the appropriate size meter box or vault.

Section 6 – Reclaimed Water Meter Option

All turbo meters shall also be available for reclaimed water service applications, with operating characteristics listed in Table 1.

All reclaimed meters will have SS bolts and bronze housings marked “Reclaimed”

Both straight reading and EER registers will include lavendar plastic shroud and lid marked with the international non-potable drinking water symbol, lavendar register face marked “Reclaimed”, Torx seal screw and cubic foot registration.

Section 7 – Customer Service and Technical Support

7.1 Customer Service

Supplier will have a fully stocked warehouse within approximately 100 miles to supply the City with required product in a timely fashion.

Standard shipments shall be made at the supplier’s expense, FOB destination. Freight charges for emergency or rush orders shall be negotiated on a case by case basis.

Standard payment terms shall be Net 30 days.

7.2 Technical Support

Supplier will employ a technical support specialist with experience in supporting an Itron radio read system. This shall include knowledge and experience with the City’s utility billing system and its interface with Itron’s route management software, handheld and mobile operations, field installations and system trouble shooting.

This specialist shall be available as a first-line response, providing on-site local support for any technical issues that may arise from time to time including training or re-training of City staff in the effective use of their Itron meter reading system.

Table1

		BADGER TSM SERIES	AWWA Min. Standards
OPERATING ACCURACY	1 1/2"	4-200 GPM	N/A
NORMAL FLOW RANGE	2"	4-310 GPM	4-160 GPM
	3"	5-550 GPM	8-350 GPM
	4"	10-1250 GPM	15-630 GPM
	6"	20-2500 GPM	30-1400 GPM
	8"	30-4500 GPM	50-2400 GPM
	10"	50-7000 GPM	75-3800 GPM
	12"	90-8800 GPM	120-5000 GPM
	16"	150-13200 GPM	N/A
	20"	300-19800 GPM	N/A
MAXIMUM	1 1/2"	160 GPM	N/A
CONTINOUS FLOW	2"	200 GPM	100 GPM
	3"	450 GPM	240 GPM
	4"	1000 GPM	420 GPM
	6"	2000 GPM	920 GPM
	8"	3500 GPM	1600 GPM
	10"	5500 GPM	2500 GPM
	12"	6200 GPM	3300 GPM
	16"	6600 GPM	N/A
	20"	10000 GPM	N/A
ACCURACY AT LOW	1 1/2"	2 1/2 GPM	N/A
FLOW (95%)	2"	2 1/2 GPM	N/A
	3"	4 GPM	N/A
	4"	8 GPM	N/A
	6"	12 GPM	N/A
	8"	20 GPM	N/A
	10"	30 GPM	N/A
	12"	65 GPM	N/A
	16"	130 GPM	N/A
	20"	200 GPM	N/A
PRESSURE LOSS AT	1 1/2"	2 PSI	N/A
AWWA MAX CAPACTIY	2"	2 PSI	7 PSI
	3"	1.3 PSI	7 PSI
	4"	3.5 PSI	7 PSI
	6"	2.6 PSI	7 PSI
	8"	1.2 PSI	7 PSI
	10"	.8 PSI	7 PSI
	12"	.62 PSI	7 PSI
	16"	.9 PSI	N/A
	20"	.95 PSI	N/A
PRESSURE LOSS AT	1 1/2"	9.9 PSI	N/A
AWWA MAX CAPACITY	2"	8.3 PSI	N/A
*WITH INTEGRAL	3"	5.0 PSI	N/A
STRAINER	4"	17.8 PSI	N/A

SIZE - The size of the meters shall be determined by the nominal size (in inches) of the opening in the inlet and outlet flanges. Overall lengths of the meters shall be as follows:

Size	Laying Length	Max. Height from Center with Local Register
1-1/2"	13" with/without strainer	4-11/16"
2"	10" without strainer, 17” with strainer	5-31/64"(EL),6-23/32"(RD)
3"	12" without strainer, 19” with strainer	5-5/16"
4”	14” without strainer, 23” with strainer	5-5/16”
6”	18” with test plug	8-1/16”
8”	20” with test plug	8-13/16”
10”	26”	10-19/32”
12”	19-11/16”	10-13/16”
16”	19-11/16”	14-7/8”
20”	19-11/16” 16-3/4”	